GA 1/3 NSIAD 88-211

United States General Accounting Office

GAO

Report to the Chairman, Committee on Armed Services, House of Representatives

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September 1988

CLOSE AIR SUPPORT

Status of the Air Force's Efforts to Replace the A-10 Aircraft

GAO/NSIAD-88-211

GAO

United States
General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

B-231215

September 2, 1988

The Honorable Les Aspin
Chairman, Committee on
Armed Services
House of Representatives

Dear Mr. Chairman:

This report, which was prepared at your request, addresses the status of the Air Force's efforts to replace its primary close air support aircraft, the A-10. A separate report (GAO/NSIAD-88-210) addresses the Air Force's efforts to upgrade its A-7 aircraft.

As arranged with your Office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of the report. At that time we will send copies to interested congressional committees; the Secretaries of Defense, the Air Force, and the Army; the Director, Office of Management and Budget; and other interested parties.

Sincerely yours,

Harry R. Finley
Senior Associate Director

Executive Summary

Purpose

The Department of Defense is considering replacement options for the Air Force's primary close air support aircraft, the A-10. The Air Force is concerned about the A-10's ability to support the Army and survive the Soviet air defense threat of the 1990s and beyond. The Congress may soon face some major funding decisions on the A-10 replacement.

The Chairman of the House Committee on Armed Services asked GAO to identify close air support requirements and review the Air Force's plans to replace or upgrade its close support aircraft, the A-10 and the A-7. This report addresses the A-10 replacement; the A-7 upgrade is addressed in a separate report. GAO discusses these efforts in separate reports because the issues associated with each are sufficiently different and significant.

Background

The A-10, developed in the early 1970s, is the Air Force's primary aircraft designed specifically to provide close air support to Army ground forces. According to the Air Force, the Soviet air defense threat in the 1990s will be considerably greater than it is today. Moreover, the U.S. Air Force will be required to perform more operations at night and in adverse weather and provide support to Army troops deep behind enemy lines.

The Air Force wants to start replacing the A-10 in 1993 because of its minimal capability at night and in adverse weather and its vulnerability to enemy air defenses, which would be especially intense behind enemy lines.

Results in Brief

The Air Force's aircraft requirements for the A-10 replacement are derived from Army air support requirements. Simply stated, the Army's requirements specify a need for both air support against targets near friendly forces (close air support) and attacks on enemy follow-on forces before they can reinforce or replace troops at the front (battlefield air interdiction).

After evaluating A-10 replacement options, the Air Force recommended to the Department of Defense that it replace the A-10s with modified F-16s, referred to as A-16s. However, the Department was concerned that the Air Force may not have sufficiently considered all viable aircraft alternatives or adequately emphasized the close air support mission and directed it to conduct another study of alternative aircraft

designs. The Air Force, along with aircraft manufacturers, is currently conducting that study.

Until the Department of Defense approves the A-10 replacement aircraft, the cost, replacement schedule, and resulting force structure changes remain uncertain.

Principal Findings

Emphasis on Close Air Support and Battlefield Air Interdiction

In the course of its present study, the Air Force (in cooperation with the Army) developed the most comprehensive statement of air support requirements to date. These requirements include specific scenarios of anticipated battle conditions for nine missions that emphasize close air support. The requirements have been provided to aircraft manufacturers as criteria for A-10 replacement designs.

The Army and the Air Force foresee close air support and battlefield air interdiction becoming similar in the future from a timing and coordination standpoint. As with close air support, they believe battlefield air interdiction will require detailed coordination and a more immediate response to identified targets. Thus, the Air Force sees a need for a more flexible aircraft to meet this requirement.

Air Force Aircraft Replacement Timetable

The Air Force wants to begin replacing its A-10s beginning in 1993, which is earlier than their service or structural life requires. This early date dictates that an existing or in-production aircraft will be selected as a replacement because a new aircraft would require 9 to 11 years to develop. One key reason the Air Force chose this date is because of the need to provide close air support to ground forces during attacks on enemy follow-on forces. However, according to Army officials, such operations cannot be effectively conducted until new surveillance and target acquisition systems are fielded. These systems are scheduled to be available for use in the mid- to late 1990s.

The Air Force started converting some A-10s to a forward air control role in 1987. Although plans call for converting 120 A-10s by the late 1990s, further conversion, according to Air Force officials, is contingent on the A-10 replacement effort.

Cost and Budget of Replacement

Cost estimates for replacing the A-10 vary considerably. Development costs are estimated from $110 million for the A-16 to $2.5 billion for a new aircraft. Production costs per unit are estimated at $7 million to $12 million (1985 dollars) for existing aircraft and from $8 million to $30 million (1988 dollars) for new aircraft.

The total cost of the A-10 replacement is difficult to estimate until key decisions on aircraft and schedule are made. The final report from the Department of Defense directed study is scheduled to be available in December 1988. According to a Department official, the Air Force budget request for fiscal year 1990 may include funds for an A-10 replacement even if the final decision on the aircraft has not been made.

Force Structure Implications

The decision on the A-10 replacement will affect the Air Force's tactical force structure. A decision to develop a new aircraft could require that the existing A-10s be maintained in the force until the late 1990s and delay the planned conversion of the A-10s to a forward air control role. Instead of maintaining the A-10s in the force over this period, the Air Force could replace them with existing F-16s.

Recommendations

This report makes no recommendations.

Agency Comments

The Department of Defense essentially concurred with the report (see app. I). It provided updated data and explanatory and other technical comments, which GAO has included in the report as appropriate.

The Department stated that the Office of the Secretary of Defense is currently considering an A-10 upgrade in ongoing studies that are separate from the Air Force's study of alternative aircraft designs. According to the office, maintaining the A-10 in the force structure or upgrading it remain options.

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Abbreviations

BAI	battlefield air interdiction
CAS	close air support
CASADA	Close Air Support Aircraft Design Alternative
MRP	mission requirements package
NATO	North Atlantic Treaty Organization
OSD	Office of the Secretary of Defense
TAC	Tactical Air Command

Introduction

The Air Force has traditionally provided tactical air support to forces involved in ground operations. The A-10, developed in the early 1970s, is the Air Force's primary aircraft designed specifically to provide close air support to ground forces.

The Air Force, however, is concerned that the A-10 will not survive the Soviet air defense threat projected for the 1990s. Thus, in 1984 it began to evaluate aircraft options to the A-10 that would improve the Air Force's ability to support future ground operations. In December 1986, the Air Force recommended two initiatives to the Office of the Secretary of Defense (OSD): (1) upgrade the Air National Guard's A-7 aircraft and (2) replace the A-10s with modified F-16s (to be called A-16s) designed specifically to provide air support to the Army. OSD officials were concerned that the Air Force had not fully considered all viable alternatives for replacing the A-10 aircraft. Accordingly, OSD approved the development and testing of two upgraded A-7 aircraft prototypes and directed the Air Force to study alternative aircraft designs to support the future ground operations.

Army and Air Force Doctrine and Guidance for Air Support

The requirements for air support to ground operations are described in the Army's basic war fighting doctrine, AirLand Battle. This doctrine requires that tactical air forces support the Army by attacking enemy ground forces in contact with friendly forces and enemy forces held in reserve.

Air Force doctrine specifically establishes missions to support the U.S. and allied forces. Tactical air missions support the Army's AirLand Battle, and the close air support (CAS) and air interdiction missions most directly support ground operations.

CAS missions provide aerial firepower against enemy forces in close proximity to friendly forces. This action is requested by a land commander when a variety of hostile targets in close proximity pose a threat or obstacle to planned and ongoing operations. The ground forces determine which targets will be attacked during a CAS mission, thus requiring detailed integration with the supported forces is required.

Air Force doctrine further explains that air interdiction is to delay, disrupt, divert, or destroy the enemy's military potential before it can be used against friendly forces. The air support directed at follow-on forces that have a near-term effect on friendly land forces is considered a part

of the air interdiction mission and is referred to as battlefield air interdiction (BAI).

The BAI mission is closely related to the CAS mission because it involves the air attack of enemy forces that could soon be in direct contact with friendly ground forces and requires close coordination and integration with a land commander. According to the Air Force, however, planning BAI missions currently requires about 24 to 48 hours once targets have been identified, which, according to Air Force and Army officials, may not be responsive enough in the future.

The North Atlantic Treaty Organization (NATO) is developing a war fighting concept that is generally consistent with both Army and Air Force doctrine in that its purpose is to impede the Warsaw Pact follow-on forces from reaching a battle when they want and at full strength. However, because NATO is a defensive alliance, it does not advocate the use of ground forces against enemy follow-on forces in Warsaw Pact territory, even though the Army's AirLand Battle doctrine does. NATO envisions using long-range weapons such as airplanes, artillery, and ground-launched guided missiles to attack enemy follow-on forces before they are engaged in direct combat with defending alliance ground forces.

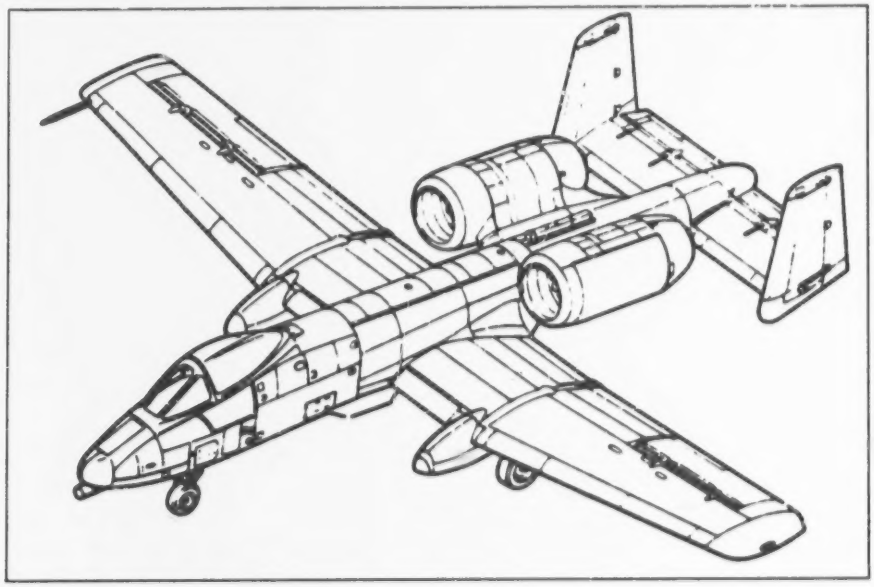
A-10 Mission and Status

The A-10 was developed specifically to perform CAS missions, although the Air Force considers any aircraft that is capable of delivering air-to-surface weapons as CAS capable. Air Force planning documents show that the A-10s make up about 64 percent of the Air Force's currently designated CAS aircraft. However, the A-10's current tasking is for both CAS and BAI, and, according to Air Force officials, pilots train for both missions.

The A-10 is a twin engine, single-seat aircraft that in a combat configuration, according to Air Force officials, can remain airborne up to 1.5 hours in a low tactics mission and has a mission radius of 300 miles, with 15 minutes in the target area. The A-10s can typically attain speeds of about 325 nautical miles per hour in a combat configuration. The aircraft has an internally mounted 30-mm 7-barrel cannon and can carry a large number and wide variety of weapons. (See fig. 1.1.)

The A-10 was first fielded in 1975, and the last one was delivered in March 1984. The Air Force purchased a total of 713 A-10s. The average age of the A-10 fleet is about 8 years, according to a Tactical Air Command (TAC) official responsible for force structure analysis. In November

Figure 1.1: A-10 Aircraft



1987, the Air Force's A-10 inventory totaled 655 aircraft. According to Air Force officials, the Air Force started converting A-10s to the forward air control role in October 1987, and complete conversion of about 120 aircraft is expected by the late 1990s.

Perceived A-10 Shortfalls Drive Search for Alternatives

According to Air Force officials, the A-10 is an effective CAS and BAI aircraft in a low- to mid-intensity air defense threat environment, such as Central and South America, and has some positive attributes such as a built-in 30-mm gun, excellent range, and the capacity to carry a large number of weapons. Also, according to the Air Force, it can sustain hits because of its redundant systems and armor protection against anti-aircraft fire.

Even though the Air Force recognizes the A-10's strengths, it is concerned about the A-10's ability to survive in an intense threat, such as in the central European battlefield of the 1990s, and to support Army ground operations. For example, the Air Force is concerned that the A-10 is too slow to be used in a package with other faster aircraft in attacks on enemy follow-on forces; therefore, it could not be counted on to support the Army's attack on follow-on forces with troops. Also, the Air Force is concerned about the A-10's lack of night and adverse

weather capabilities and its ability to survive in the more lethal CAS and BAI environments.

Because of its concerns about the A-10's survivability and effectiveness, the Air Force evaluated aircraft options to the A-10. In 1984, shortly after the last A-10 was delivered, the Air Force initiated a "Close Air Support Investigation" to explore potential replacements. In 1985 the Air Force published a Request for Information, asking aircraft manufacturers to provide information on near-term alternatives to the A-10.

OSD also expressed concern over the A-10's effectiveness and directed the Air Force to conduct a feasibility study of aircraft to replace the A-10. The Close Air Support Aircraft Design Alternative study is being conducted with participation by aircraft manufacturers. The Air Force estimates the study will cost $9.4 million, which includes the cost to evaluate the final results.

As reflected in the Air Force's 1986 proposal to OSD and in TAC's fighter roadmap, the Air Force wants to start replacing the A-10s with A-16s in the early 1990s. However, until OSD approves a replacement aircraft, the cost, replacement schedule, and resulting force structure changes remain uncertain.

Congressional Concern

The National Defense Authorization Act for Fiscal Years 1988 and 1989, Public Law 100-180, requires the Secretary of Defense to submit to the Senate and House Committees on Armed Services a report containing a master plan for meeting the Secretary's requirements for CAS and BAI. The report is to specify the requirements with respect to equipment, costs, schedule, and acquisition strategy and the roles for active and reserve forces in each of the military services.

Recently, the Senate and House Committees on Armed Services, in their respective reports on the National Defense Authorization Act for Fiscal Year 1989, expressed concerns about Air Force efforts to modernize its CAS aircraft. The Senate Committee concluded that the

> "Air Force has devoted insufficient attention to the area of modernizing close air support. The Air Force has programmed to spend some $13 billion to develop a new generation air to air fighter, but has budgeted virtually nothing to develop a new generation replacement aircraft for close air support."

The House Committee said that the Department of Defense was not giving adequate consideration to the full range of aircraft options that may be available. It strongly recommended that all CAS candidates, including an upgraded A-10 and the AV-8B Harrier, the Marine Corps' CAS aircraft, should receive due consideration.

Objectives, Scope, and Methodology

In April 1987, the Chairman, House Committee on Armed Services, requested that we evaluate the CAS mission requirements and the Air Force's plans for meeting those requirements. In subsequent meetings with Committee representatives, we agreed to identify the Army's requirements and review Air Force plans to replace or upgrade its primary CAS and BAI aircraft, the A-10 and A-7. This report only addresses the CAS requirements and the Air Force's plans to replace the A-10; a separate report addresses the A-7 issues. We discuss these efforts in separate reports because the issues associated with each are sufficiently different and significant.

We reviewed the Army's CAS requirements and the extent to which these mission requirements have been defined. We also reviewed the Air Force's and OSD's plans and processes to identify alternatives to the A-10.

To accomplish this review, we interviewed and obtained data from officials at the following locations:

- Office of the Secretary of Defense, Washington, D.C., for information on the direction and expected results of the current A-10 replacement study;
- Air Force Headquarters, Washington D.C., for information on the need to replace the A-10 and alternative study efforts;
- Tactical Air Command, Langley Air Force Base, Virginia, for mission and aircraft requirements information and justification for and implication of replacing the A-10;
- Aeronautical Systems Division, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, for information on the current and past studies on A-10 replacement aircraft;
- Armament Division, Air Force Systems Command, Eglin Air Force Base, Florida, for information on weapons development for CAS and involvement in studies to replace the A-10;
- Air Force Logistic Center, McClellan Air Force Base, California, for information on A-10 modifications and service life;

- Army Headquarters, Washington D.C., for information on CAS requirements and Army involvement in the current CAS aircraft alternatives study;
- Training and Doctrine Command, Fort Monroe, Virginia, for information on the battlefield of the 1990s and the Army's need for CAS;
- Institute for Defense Analyses, Alexandria, Virginia, for information on studies on alternative A-10 replacement aircraft.

We also obtained operational perspectives on requirements for air support to ground forces at Headquarters, United States Army Europe, Heidelberg, West Germany; Headquarters, VII Corps, Stuttgart, West Germany; Headquarters, V Corps, Frankfurt, West Germany; and the Army National Training Center, Fort Irwin, California.

In addition, operational perspectives on the A-10 and alternative aircraft were obtained at Headquarters, United States Air Forces in Europe, Ramstein Air Force Base, West Germany; 354th Tactical Fighter Wing, Myrtle Beach Air Force Base, South Carolina; 388th Tactical Fighter Wing, Hill Air Force Base, Utah; Tactical Fighter Weapons Center, Nellis Air Force Base, Nevada; 57th Fighter Weapons Wing, Nellis Air Force Base; 4440th Tactical Fighter Training Group, Nellis Air Force Base; 355th Tactical Training Wing, Davis-Monthan Air Force Base, Arizona; 602nd Tactical Air Control Wing, Davis-Monthan Air Force Base; and 35th Tactical Training Wing (Air Warrior), George Air Force Base, California.

Our work was conducted in accordance with generally accepted government auditing standards. The Department of Defense provided comments on a draft of this report. These comments have been included in the report as appropriate and are presented in appendix I.

Chapter 2

Army Requirements for Air Support

The Army derives its requirements for air support from its AirLand Battle doctrine, which has evolved to counter the Warsaw Pact's method of attack and the superior numbers of troops and weapons in central Europe. As envisioned for the 1990s, air support near friendly troops would be employed (1) deeper behind enemy lines, (2) against far more intense air defenses, (3) at night and in adverse weather, and (4) immediately as needed. The Army also recognizes the need for air support in other geographical areas where a battle may not be as intense.

Battlefield of the 1990s

Army doctrine states that any major conflict will involve Soviet battle doctrine either directly or indirectly through Soviet allies using Soviet equipment and strategies. U.S. Armed Forces are required to be prepared to meet potential military challenges worldwide, ranging from low-intensity operations such as terrorist threats to mid- to high-intensity operations such as a Warsaw Pact or Soviet invasion. Although the Army war fighting doctrine acknowledges other threats, it concentrates on how to counter the threat posed by Warsaw Pact forces in the mid- to high-intensity conflicts.

The Army doctrine further explains that the Warsaw Pact is expected to establish momentum rapidly by employing superior numbers of troops and equipment in offensive operations. The Warsaw Pact strategy would include a rapid, mobile offensive conducted by succeeding waves of ground forces. This strategy would require timely reinforcements from follow-on forces to maintain momentum at the front lines of battle. Therefore, Warsaw Pact success would depend on the smooth flow of troops and equipment from the rear area.

The U.S. Army developed AirLand Battle to counter the Warsaw Pact's strategy. According to Army doctrine, if U.S. forces can interrupt the timely flow of reinforcements while maintaining solid defenses at the front line, Warsaw Pact forces at the main battle area will lose momentum and will eventually be forced to surrender or retreat. An important part of the AirLand Battle doctrine is the attack of follow-on forces beyond the front lines through such means as artillery, air interdiction, and operations involving ground troops.

Army doctrine characterized the anticipated mid- to high-intensity battlefield environment as being chaotic, intense, and highly lethal. It does not expect the front lines to be the traditional, relatively straight boundary separating the friendly troops from the enemy, but to be fluid and non-linear.

The Army doctrine incorporates plans to fight at night and in all weather conditions. According to the Army, this technological edge could provide the allied forces with opportunities to destroy high-priority targets at night, which is when the targets will be most vulnerable due to degraded night capabilities.

Army doctrine also recognizes a need for tactical air support in low-intensity conflicts such as those that could arise in Central America. It defines low-intensity conflict as "...the low end of the conflict spectrum...[that] will pit the Army forces against irregular or unconventional forces, enemy special operations forces, and terrorists." The Army plans to use special operations forces that can deploy rapidly and exercise restraint in the military response. It expects the enemy would attack at an unpredictable, intermittent pace occurring any hour of the day and under any weather conditions with forces that will be camouflaged in small units, dispersed and fleeting, and difficult to locate. According to the Army, the air defense threat in these conflicts would not be as intense as the central European threat, although it could involve technologically advanced weapons.

Army Requirements for Air Support to Ground Forces

The AirLand Battle doctrine recognizes a need for tactical air support across the entire spectrum of the battlefield. In a 1985 memorandum of agreement, the Army and the Air Force agreed that CAS needs to be effective

"...on the non-linear battlefield across a broad spectrum of combat scenarios and threats ranging from the friendly rear area to the traditional main battle area and the deep maneuver arena."

In an April 1987 briefing to OSD, the Army presented its tactical air support requirements. These included high sortie rates, responsiveness, the ability to survive and penetrate enemy defenses, the ability to operate under the weather day and night, the capability to carry a wide variety of weapons in sufficient quantities to be effective, and the flexibility to provide support across the entire spectrum of the battlefield.

Air Force officials noted that aircraft capable of performing future CAS missions would have characteristics required of air interdiction aircraft. The Air Force believes these characteristics would include high subsonic speed and maneuverability that allows the aircraft to avoid air defense threats.

The Army indicated a need for responsive and concentrated firepower from CAS aircraft. On the defense, the Army envisions primary CAS targets as tactically deployed moving or stationary tanks, mounted or dismounted infantry, and supporting artillery. On the offense, primary targets will include tanks, command and control vehicles, and mounted or dismounted infantry.

The Army indicated the need for more timely attack on BAI targets. Officials at the Army's Training and Doctrine Command noted that enemy artillery units would be one of the European Command's highest priority targets in a European conflict because enemy artillery would vastly outnumber friendly artillery. Because of this lack of sufficient friendly artillery, the Army will look to the Air Force to kill some of these targets. However, Air Force and Army officials have expressed concern that the current system requires 24 to 48 hours to schedule and execute missions against BAI targets and, as a result, is not responsive enough to attack enemy artillery when needed.

Although operations against enemy follow-on forces involving ground forces is a part of current Army doctrine, Army officials told us that the Army may not be able to implement the doctrine effectively until the late 1990s. Effective implementation of these operations will require the fielding of surveillance, targeting, and weapons systems that are under development, such as the Joint Surveillance Target Attack Radar System and the Army Tactical Missile System. The Office of Technology Assessment's June 1987 study, New Technology for NATO Implementing Follow-on Forces Attack, reached a similar conclusion about conducting these operations. It found that

"NATO currently has some quite limited capability to implement this concept [i.e., attack of follow-on forces], but faces three major shortcomings: adequate resources for reconnaissance, surveillance, and target acquisition; capable munitions in sufficient quantities as well as the weapons to distribute those munitions; and total systems—from surveillance to target destruction—that can respond rapidly, flexibly, and effectively across large areas."

Army and Air Force officials said the Joint Surveillance Target Attack Radar System was the primary system needed for a fully effective capability to attack follow-on forces. Originally, the Air Force planned to begin fielding this system in 1993, but this date has slipped to about 1996 due to technology development delays and budget constraints.

Air Force Efforts to Meet Army's Air Support Requirements

Because of its concern over the A-10's ability to meet the Army's tactical air support requirements effectively, the Air Force assessed aircraft options and recommended replacing the A-10 with the A-16. However, OSD did not concur with this recommendation and tasked the Air Force with conducting the current Close Air Support Aircraft Design Alternative study to further assess alternative replacement aircraft to the A-10. As part of the study, the Air Force and the Army developed the most comprehensive statements of tactical air support requirements to date, which are part of the study's mission requirements package (MRP).

The study results are scheduled to be briefed to the Close Air Support Mission Area Review Group by September 1988, about 5 months later than planned because of unexpected delays in finalizing the MRP. The Air Force expects the total study cost to be about $9.4 million. OSD plans to use the study results in additional analyses to determine whether or not a new aircraft is more cost effective and survivable than a derivative of an existing aircraft.

Air Force Concerns About A-10s

Even though Air Force officials spoke favorably of the A-10's effectiveness in low- to mid-intensity conflicts, they questioned its effectiveness in a high-intensity conflict, such as one that would be encountered in central Europe. Air Force officials were most concerned about the A-10's survivability, given the increasing number and lethality of Warsaw Pact air defense systems being fielded or planned for the 1990s. The projected threat includes a combination of anti-aircraft artillery with improved radar, improved infrared and radar-controlled surface-to-air missiles, emerging laser and radar frequency energy weapons, improved Soviet air-to-air fighters, and improved Soviet counter air threat.

In October 1987 United States Air Forces in Europe completed a threat analysis for the A-10 in the European central region that supports the Air Force's concerns about the A-10's ability to survive the increasing air defense capabilities of the Warsaw Pact forces. This analysis, which addressed the current and future Soviet threat to the A-10 in this region, "...suggests that the A-10 is rapidly becoming less survivable on today's battlefield." According to Air Force officials, the A-10's relatively slow speed and inability to maintain speed and acceleration in tight turns increase its vulnerability to the lethal hits in this environment. The slower the aircraft's speed, the longer the aircraft is exposed to the air defense weapons.

According to the Air Force, another major shortfall is the A-10's limited night and adverse weather capabilities. Although the Air Force planned to equip the A-10 with the Low Altitude Navigation and Targeting Infrared for Night system, which would provide night and adverse weather capabilities, the Air Force decided against it because of the system's high cost. Thus, as currently configured, the A-10 can only perform limited night operations with the use of phosphorous flares to illuminate the target area. In addition, it does not carry any type of forward-looking infrared equipment, which is needed for effective night CAS operations. Furthermore, the A-10 lacks terrain avoidance avionics, which would require night CAS operations to be flown at higher-than-desired altitudes to avoid collisions with the ground, thus increasing exposure to enemy air defense units. Similar problems are encountered with CAS operations in adverse weather that would limit pilot visibility for flight safety and target acquisition.

Finally, Air Force officials expressed concern about the A-10's ability to support the Army in its attack on follow-on forces with troops and for more timely BAI. In such operations, attacking aircraft are expected to encounter high-intensity air defense threats in route to, from, and in the target area. According to Air Force officials, most aircraft would have difficulty surviving this threat without assistance in suppressing air defenses. Air Force officials viewed the A-10 as being too slow to accompany faster aircraft that may be required to suppress enemy air defenses.

CAS requires an immediate response against targets and detailed coordination between the Army ground unit and Air Force aircraft. According to the Air Force, BAI not only requires detailed coordination between air and land commanders but also 24 to 48 hours to plan. Both the Army and the Air Force foresee a need for a more immediate response to BAI targets, and officials from both services stated that CAS and BAI missions are becoming similar from a timing and coordination standpoint. Thus, they see an advantage for the land commander to have access to a flexible aircraft that can perform both missions effectively.

Prior Air Force Assessments of Aircraft Options

In April 1985 the Air Force issued a report entitled Close Air Support Investigation which was the culmination of a 6-month "quick-look" at designs for primarily new, fixed-wing CAS aircraft for the mid- to late-1990s. Four aircraft manufacturers—Boeing Military Airplanes, Fairchild Republic Company, Northrop Corporation, and Rockwell International—submitted conceptual aircraft designs in response to the Air Force's request for information.

After evaluating the designs, which included a modified A-10, the Air Force reported that (1) the A-10 without extensive improvements would lose its effectiveness in the CAS role in the mid-1990s due to, among other things, increased threat, (2) the CAS issue required further analysis before the optimum solution could be identified, and (3) modifications to aircraft such as the F-16 should be considered to examine their feasibility and cost effectiveness in the future CAS role.

The investigation found

> "Survivability is the key issue and requires a combination of moderately low signatures, hardening, systems for threat avoidance and on-board defense suppression, and crew protection as well as high performance and maneuverability at high subsonic speed (Mach 0.7-0.85) and low altitude (approximately 200 ft)."

The Air Force then assessed modifying aircraft for the CAS and BAI missions for two reasons: cost and time. According to Air Force officials, the tactical aircraft development priority is the Advanced Tactical Fighter, and the Air Force cannot afford to fund two development projects concurrently. They fear that any additional developmental efforts would divert funds from the advanced fighter. Air Force officials also noted that, historically, new aircraft development efforts take about 10 years to complete before any production aircraft become available. This time frame is not compatible with the Air Force's desire to have the follow-on aircraft available by 1993 and restricts the options to modifying existing or in-production aircraft.

In April 1985 the Air Force issued a request for information to industry to obtain design alternatives for a follow-on aircraft that could perform both the CAS and BAI missions and could be available for production beginning in the late 1980s. The solicitation noted that the need for a CAS aircraft does not warrant the delay and expense of a totally new development effort and that the focus of the study should be on modifying aircraft.

Four contractors responded with proposals—General Dynamics with an F-16 derivative, LTV Corporation with a modified A-7, Northrop Corporation with the F-20, and McDonnell Douglas Corporation with the AV-8B. Subsequently, in December 1986, the Air Force recommended two initiatives to OSD. The first was to upgrade the Air National Guard's A-7 aircraft, and the second was to replace the A-10 with the A-16.

OSD authorized the development and testing of two modified A-7 prototypes, but it did not approve replacing the A-10s with A-16s. OSD officials were concerned that the Air Force had not considered all the viable alternatives to the CAS and BAI issue, especially the possibility of developing a low-cost aircraft used only for CAS. OSD wants to ensure that the aircraft selected to replace the A-10 is the most cost-effective aircraft for the CAS mission. However, OSD recognized that aircraft able to perform CAS missions and survive the battlefield of the 1990s will have characteristics that will enable it to perform BAI missions.

The Air Force's Scientific Advisory Board also raised concerns about the follow-on aircraft. It concluded that CAS and BAI missions are sufficiently different for each to warrant a separate aircraft and emphasized that "the mission should dictate the aircraft rather than vice versa." The Board also expressed a concern over the lack of progress in CAS weapon development efforts, noting that "...weapons (and their required avionics) cannot continue to be treated as an afterthought to aircraft and propulsion." In its comments on our report, the Department of Defense stated that the paucity of CAS weapons and large inventory of 30-mm ammunition make the A-10 look very attractive.

Close Air Support Aircraft Design Alternative Study

As a result of its concerns, OSD directed the Air Force to perform the Close Air Support Aircraft Design Alternative (CASADA) study and established OSD controls over the study. In February 1987 OSD established the Close Air Support Mission Area Review Group to oversee the study, noting that it will be developed and monitored by OSD, the Joint Chiefs of Staff, the Air Force, and the Army. This review group has the authority to control study funding and to review and approve the statement of work and the mission requirements document before release to contractors.

Study Approach

The Air Force designed a three-phase approach to the study. Phase 1 problem definition, was the Air Force's responsibility. It included developing a comprehensive definition of the CAS and BAI mission requirements and culminated in a detailed mission requirements document. The Army defined its requirements for CAS and BAI missions, which assisted the Air Force in completing its work for this phase. Phase 2, aircraft design concept development, is the aircraft manufacturers' responsibility and involves developing and evaluating alternative aircraft designs. These are initial conceptual paper designs and data packages, not fully developed blueprints ready for the production line. Phase 3, aircraft alternatives assessment, is also the Air Force's responsibility and will include assessing the reasonableness of the designs and submitting the assessments to the review group.

Study Schedule Delayed

According to the CASADA study's original schedule, contracts were to be awarded by August 1, 1987, and the study was to be completed by September 1988. However, delays in finalizing the MRP caused about a 5-month slip in the contract award dates and postponed the completion date to December 1988.

Finalizing the MRP took longer than the Air Force anticipated. According to Air Force officials, Air Force Headquarters received the draft MRP for approval on July 27, 1987, after the CAS and BAI mission requirements had been coordinated with various cognizant Air Force and Army organizations such as TAC and the Army's Training and Doctrine Command. Air Force Headquarters requested additional information on Army requirements and battlefield scenarios.

OSD recommended changes to the Air Force in a November 17, 1987, letter. These changes included inserting design-to-cost guidance and specific aircraft performance parameters. According to Air Force and OSD officials, compromises were reached on the recommendations. For example, the Air Force inserted a low design-to-cost figure of $7 million but not an upper limit cost figure. The MRP was finally approved for release to aircraft manufacturers in December 1987.

Study Cost

According to the CASADA project manager, the study will cost about $9.4 million—about $4.85 million for aircraft manufacturers and $4.55 million for in-house study design, MRP development, final design assessments, and OSD's evaluation of the CASADA study results.

The Air Force received proposals from nine manufacturers and awarded fixed-price contracts to six, as shown in table 3.1. Aircraft manufacturers not selected were Fairchild Republic Company, LTV Corporation, and Sikorsky Aircraft Corporation. Fairchild presented a modified A-10; LTV an austere, nominal performance new design; and Sikorsky a new design with an X-wing, rotor concept.

Table 3.1: CASADA Study Contract Prices

Aircraft manufacturers	Total award
Boeing Military Airplanes	$839,500
General Dynamics Corporation	1,000,000
Lockheed Corporation	750,850
McDonnell Douglas Corporation	750,000
Northrop Corporation	755,546
Rockwell International Corporation	750,000
Total	**$4,845,896**

Study Results

According to the CASADA program manager, the Air Force expects to get about 20 aircraft designs from the study; one will be General Dynamic's modified F-16. General Dynamics' contract is to design a totally new aircraft and a modified F-16. The remaining contractors are to design only new aircraft.

The Air Force plans to assess the reasonableness of the manufacturers' designs and evaluations in comparison to MRP requirements. It does not plan to rank the designs. The contractors' designs and evaluations and the Air Force's assessments will be provided to the review group for further evaluation.

According to OSD officials, two contractors will compare 5 to 10 of the manufacturers' designs with current aircraft to determine the designs that best meet mission requirements. The contractors will compare aircraft designs for survivability, effectiveness, and cost.

Mission Requirements

Before the CASADA study, CAS requirements were not clearly defined. The Air Force's Aeronautical Systems Division at Wright-Patterson Air Force Base, which analyzed the proposals from the 1985 solicitation, concluded that all the proposed design alternatives were technically viable candidates and that it was difficult to eliminate a candidate because CAS requirements were not clearly defined.

Since then, both the Army and the Air Force have more fully explained tactical air support requirements. For example, in April 1987 the Army provided OSD and the Air Force with statements of tactical air support requirements for both mid- to high-intensity and low-intensity conflicts based on AirLand Battle concepts. These requirements are the most detailed requirements developed to date and are included in the MRP, which participating manufacturers should use for phase 2.

The MRP is to provide "...a comprehensive data base of design and alternative mission requirements, aircraft force structure, capabilities, needs, ideas, aircraft, weapon, and avionics technologies...." Thus, the MRP listed, as did the 1985 solicitation, general CAS and BAI mission tasks, from which the aircraft manufacturers would develop their designs. These tasks were

- navigation,
- penetration of high-threat air defenses,
- communications interface with the Tactical Air Control System,
- target acquisition, and
- precision weapon employment.

In its comments on our report, the Department of Defense stated that the inclusion of BAI as a prime (rather than secondary) mission for the CASADA designs means the aircraft may be designed to the BAI requirements.

To clarify requirements further, the Air Force also included in the MRP battlefield scenarios for nine specific operational missions that it will use to evaluate the manufacturers' aircraft designs.

The Air Force also provided the manufacturers with aircraft design options to be considered in phase 2. These options were divided into three categories: (1) aircraft hardware requirements, (2) aircraft performance parameters, and (3) reliability, maintainability, and supportability requirements. Each category was further subdivided into specific detail, for example, aircraft hardware requirements specified communications and navigation features such as jam-resistant radios, digital communications capabilities, and automatic terrain avoidance systems.

Some of the design requirements for new aircraft are more stringent than those for modified aircraft. For example, under the reliability and maintainability requirements, combat turnaround time for new aircraft

is 15 minutes versus 25 minutes for modified aircraft. Similarly, airlift support requirements for one squadron of new aircraft is 5 C-141B transport aircraft equivalents, whereas the requirement for one squadron of modified aircraft is 14 C-141B equivalents.

Cost, Schedule, and Force Structure Implications of A-10 Replacement

The Air Force recommended replacing the A-10 aircraft with the A-16 to minimize cost and to have a replacement in the early 1990s. However, OSD and the Air Force are considering other alternative aircraft to the A-10. Regardless of the aircraft selected, this decision will affect both the Air Force's budget and force structure.

Cost and Budgetary Implications Unknown

The total program cost of the A-10 replacement is unknown and cannot be estimated until key decisions on the aircraft and its schedule are made.

According to the Air Force, developing CAS and BAI aircraft to replace the A-10 would require $2 billion to $2.5 billion. In its comments on the MRP, OSD's review group recommended that additional new aircraft designs be developed to meet unit cost constraints between $7 million and $13 million (fiscal year 1988 dollars). The CASADA study's MRP set a low unit cost limit of $7 million, but not an upper limit. According to the CASADA study program manager, the contractors involved in the CASADA study are projecting a unit cost that ranges from $8 million to $30 million (fiscal year 1988 dollars).

Contractors responding to the Air Force's 1985 request for information, which considered modifying in-production aircraft, estimated unit cost from $7 million to $12 million (fiscal year 1984 dollars). According to Air Force officials, the A-16 was estimated to cost about $110 million for development and about $13 million per aircraft (fiscal year 1986 dollars).

Because the CASADA study is underway and no decisions on the A-10 replacement have been made, Air Force officials are uncertain when funding for a replacement aircraft will be requested. However, in a March 21, 1988, hearing before the Senate Committee on Armed Services, the Chairman of OSD's Close Air Support Mission Area Review Group stated that such funds may be requested in the fiscal 1990 budget. This request, he noted, will be made even if the final decision on the replacement aircraft has not been made. In its comments on our report, the Department of Defense stated that it would reprioritize programs and/or use existing aircraft funding lines for procurement of a new CAS aircraft.

Schedule for Replacing A-10s

The Air Force wants to start replacing the A-10s in the CAS role as early as 1993, some 2 to 5 years sooner than the earliest A-10 retirement, based on its 20-year service life. This replacement would also occur much earlier than required by the A-10's structural life, which Air Force Logistics Command officials estimate will exceed the planned 20-year service life. However, the current CASADA study establishes two time frames for replacing the A-10: an upgraded, existing/in-production replacement aircraft by 1992 to 1995, and a new aircraft whose time frame will be determined by available technology and acquisition strategy.

According to Air Force officials, the Air Force started using A-10s as forward air control aircraft in 1987 and plans to change the mission for some 120 A-10s by the late 1990s. They also stated that the conversion is driven primarily by decisions on the A-10 replacement effort not by the need for early A-10 replacement.

The Air Force has not clearly stated why the 1993 time frame is critical. Some Air Force officials believed early replacement of the A-10 is needed to have an operational capability by the late 1990s. In a March 21, 1988, hearing before the Senate Committee on Armed Services, the Chairman of OSD's Close Air Support Mission Area Review Group stated that he was not sure that the mid-1990s date for replacing the A-10 is all that critical. However, Air Force studies show that enemy threat in the CAS and BAI arena is anticipated to increase significantly in the post-1994 time frame. Air Force studies also indicate that the survivability of the A-10 and other aircrafts will suffer due to this increasing threat.

According to Army officials, the Army will not be capable of conducting operations against follow-on forces with troops until the late 1990s, except on a limited scale. To perform this maneuver effectively, Army officials believed that the ability to see and plan deep into the battlefield is critical. This capability is expected to be improved significantly with the development of the Joint Surveillance and Target Attack Radar System, which is expected to be available for use in the mid- to late 1990s. Hence, the A-10's early replacement does not appear to be predicated on the Army's CAS needs beyond the front lines.

Force Structure Implications

The decisions on the A-10 replacement will affect the Air Force's tactical force structure. For example, a replacement aircraft, which could take about 9 to 11 years to develop, could require maintaining existing

A-10s in the force until the late 1990s. This, in turn, could delay the planned conversion of the 120 A-10s to a forward air control role. According to TAC officials, the Air Force plans to replace one Air National Guard unit's A-10s with F-16s in April 1989 and designate that unit's aircraft to perform the CAS and BAI missions.

The Air Force could also decide to replace the remaining A-10s with F-16s. If this occurs, about 50 percent of the tactical forces would consist of F-16-type aircraft by the year 2000, according to Air Force officials. Additionally, if OSD approves the A-16 as the A-10 replacement, the Air Force could see an earlier change in the tactical force structure than it would see if it decides to develop a replacement aircraft.

Comments From the Director of Defense Research and Engineering

DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING

WASHINGTON, DC 20301-3010

3 AUG 1988

Mr. Frank C. Conahan
Assistant Comptroller General
National Security and
International Affairs Division
US General Accounting Office
Washington, DC 20548

Dear Mr. Conahan:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) Draft Report, "CLOSE AIR SUPPORT: Status of Air Force Efforts to Replace the A-10 Aircraft," Dated June 6, 1988 (GAO Code 392315), OSD Case 7668. The Department concurs with most of the GAO findings. The GAO makes no recommendations.

As the GAO indicated, the Department is considering alternatives to modernize the Air Force Close-Air-Support Aircraft, the A-10 and the A-7. While this report focuses on the A-10, several options are being considered. The Defense Resources Board addressed the Air Force Close-Air-Support issue in the Fall of 1987, and will consider it again in the Fall of 1988, prior to finalizing the FY1990-FY1991 Budget Submission.

Detailed DoD comments on each finding are provided in the enclosure. The Department appreciates the opportunity to comment on the draft report.

Sincerely,

Robert C. Duncan

Enclosure

GAO DRAFT REPORT - DATED JUNE 6, 1988
(GAO CODE 392315) OSD CASE 7668

"CLOSE AIR SUPPORT: STATUS OF AIR FORCE EFFORTS TO REPLACE THE A-10 AIRCRAFT"

DEPARTMENT OF DEFENSE COMMENTS

* * * * *

FINDINGS

- FINDING A: Army and Air Force Doctrine and Guidance for Air Support. The GAO reported that the requirements for air support to ground operations are described in the Army's basic warfighting doctrine, AirLand Battle, which states that the Air Force must support the Army by attacking enemy ground forces in contact with friendly forces and enemy forces held in reserve. The GAO further reported that Air Force doctrine, in turn, establishes missions to support the Army. While all tactical air missions support the Army's AirLand Battle, the GAO found that two missions--close air support (CAS) and air interdiction--most directly support the Army ground operations. The GAO noted that Air Force doctrine sets forth the purpose of air interdiction as delay, disruption, diversion or destruction of the enemy's military potential before it can be brought to bear on friendly forces. In addition, the GAO explained the air support directed at targets that have a near-term effect on friendly land forces, is considered battlefield air interdiction (BAI) and is closely related to the CAS in that it also requires the air attack of enemy follow-on forces that have a near term effect on friendly ground forces. (pp. 3-4, pp. 9-10/GAO Draft Report)

Now on pp. 2-3, 8-9.

DOD RESPONSE: Concur. There are differences between CAS and BAI, especially in timing and coordination. The near term effect of BAI targets may not be as critical as the immediate effect of most CAS targets. Also, BAI may not require coordination with the local operating unit--it is not conducted in close proximity to friendly troops and coordination is generally accomplished through higher headquarters (such as Division).

- FINDING B: A-10 Mission and Status: Perceived A-10 Shortfall Drives Search for Alternatives. The GAO reported the A-10 is a twin engine, single seat aircraft that (1) can remain airborne up to 1.7 hours in the close air support role, (2) has a mission radius of 300 miles, and (3) can attain combat speeds of 438 miles per hour. The GAO found the A-10s make up about 66 percent of the currently designated CAS aircraft, although the A-10 current tasking includes both CAS and BAI and pilots train for both

Enclosure

missions. The GAO observed that the A-10 is an effective CAS and BAI aircraft in a low air defense threat environment, such as Central and South America, having some positive attributes, such as the capacity to carry a large number of weapons, a built-in 30mm gun, an excellent range and the ability to sustain hits because of its redundant systems and armor. While recognizing the A-10 strengths, the GAO found that the Air Force is nonetheless concerned about the A-10 ability to survive in an intense threat, such as in the Central European battlefield of the 1990s. The GAO further reported that the Air Force is also concerned because (1) the A-10 is too slow to be used in a package with other faster aircraft in attacks on enemy follow-on forces and (2) the A-10 lacks night and adverse weather capabilities. The GAO noted that, because of these concerns, the Air Force evaluated aircraft options to the A-10 and, in 1984, shortly after the last A-10 was delivered, initiated a "Close Air Support Investigation" to explore potential replacements. The GAO noted the Office of the Secretary of Defense (OSD) also expressed concern over the A-10 effectiveness and, in 1986, directed the Air Force to conduct a feasibility study of replacement aircraft. The GAO observed that the Close Air Support Aircraft Design Alternative study is currently being conducted, with participation by aircraft manufacturers, and will cost $8.5 million (not including the cost of evaluating the study results). The GAO also observed that, as reflected in the Air Force 1986 proposal to the OSD and in the Tactical Air Command fighter ROADMAP, the Air Force wants to start replacing the A-10s with A-16s in the early 1990s. The GAO concluded, however, that until the DoD approves a replacement aircraft, the cost, replacement schedule, and resulting force structure changes remain uncertain. (pp. 2-4, pp. 10-12/GAO Draft Report)

Now on pp. 2-3, 9-11.

DOD RESPONSE: Partially concur. The direction in 1986 to the Air Force was to initiate alternative design studies for a follow-on CAS aircraft other than the F(A)-16 recommended by the Air Force. The intent of this direction was and still is to determine if there is a more survivable and lower cost alternative to replacing the A-10. The A-10 can perform the BAI mission in low/mid-intensity conflicts. The maximum speed of the A-10 would be about 438 miles per hour; an operational speed with a weapons load is much lower. The combat speed of the A-10 with a typical combat load is approximately 375 miles per hour or 325 knots.

- **FINDING C: Congressional Concerns**. The GAO reported that the National Defense Authorization Act for FY 1988 and FY 1989 (Public Law 100-180) requires the Secretary of Defense to submit a report to the Senate and House Committees on Armed Services containing a master plan for meeting the Secretary's requirements for CAS and BAI. According to the GAO, the report will specify the equipment,

costs, schedule, requirements acquisition strategy and active reserve forces roles for each of the Military Services. The GAO observed that the Senate and House Committees on Armed Services, in their respective reports on the National Defense Authorization Act for FY 1989, expressed concerns about Air Force efforts to modernize CAS aircraft. The GAO specifically noted the House Committee concern that the DoD was not giving adequate consideration to the full range of available aircraft options and strongly recommending all CAS candidates receive due consideration, including an upgraded A-10 and the AV-8B Harrier (which is the Marine Corps close air support aircraft). (p. 13/GAO Draft Report)

Now on pp. 11-12.

DOD RESPONSE: Concur

- **FINDING D: Battlefield of the 1990s**. The GAO reported that, according to Army officials, any major conflict in the 1990s will involve Soviet battle doctrine, either directly, or indirectly, through Soviet allies using Soviet equipment and strategies. The GAO observed that, as a result, U.S. Forces must be prepared to meet potential military challenges worldwide, ranging from low-intensity operations (i.e., terrorist threats) to mid-to high-intensity operations (such as a Warsaw Pact or Soviet invasion). The GAO further reported that, while acknowledging other threats, the Army warfighting doctrine has evolved to counter the threat posed by Warsaw Pact forces in the mid-to high-intensity conflicts and the Army developed AirLand Battle specifically to counter the Warsaw Pact strategy. The GAO observed it is the Army strategy that, if U.S. forces can interrupt the timely flow of reinforcements, while maintaining solid defenses at the front line, the Warsaw Pact Forces at the main battle area will lose momentum and eventually be forced to surrender or retreat. The GAO noted that a major part of the AirLand Battle doctrine, therefore, is the attack of follow-on forces, beyond the front lines, through artillery, air interdiction, and operations involving ground troops. The GAO observed that the Army has characterized this type of battlefield environment as chaotic, intense, and highly lethal. The GAO also observed that the Army does not expect the front lines to be the traditional, relatively straight, boundary separating the friendly troops from the enemy, but rather fluid and non-linear.

  The GAO further reported the Army also recognizes a need for tactical air support in low-intensity conflicts, such as those that could arise in Central America. According to the GAO, the Army defines low intensity conflict, as "...the low end of the conflict spectrum...(that) will pit the Army forces against irregular or unconventional forces, enemy special operations forces, and terrorists." The GAO indicated the Army plans to use special operations forces

Now on pp. 2-3, 14-15.

that can deploy rapidly and exercise restraint in the military response and expects an unpredictable, intermittent pace occurring any hour of the day and under any weather conditions, with enemy forces camouflaged in small units, dispersed and fleeting, and difficult to locate. The GAO concluded that, while the air defense threat in these conflicts would not be as intense as the central European threat, they could involve technologically advanced weapons. (pp. 2-4, pp. 16-17/GAO Draft Report)

DOD RESPONSE: Concur. A non-linear Forward Line Own Troops (FLOT) does not appreciably change the nature of CAS. The CAS mission still requires close coordination with friendly elements and positive target identification. Also, attack of follow-on forces as a major part of AirLand Battle is too narrow a definition. The Army uses the term deep operations. Consider in the following context: "while close operations bear the ultimate burden of victory or defeat, deep operations are critical as they influence conditions under which future close operations will be conducted. Deep operations offer the opportunity to shape the battlefield. The linkages between the operations are interdependent and require continuous synchronization." (Army doctrine)

- FINDING E: Army Requirements For Air Support To Ground Forces. The GAO found that the AirLand Battle doctrine recognizes a need for tactical air support across the entire spectrum of the battlefield. The GAO reported that, in April 1987, the Army presented its tactical air support requirement to the Office of the Secretary of Defense, which included (1) high sortie rates, (2) responsiveness, (3) ability to survive and penetrate enemy defenses, (4) ability to operate under the weather day and night, (5) capability to carry a wide variety of weapons in sufficient quantities to be effective, and (5) flexibility to provide support across the entire spectrum of the battlefield. The GAO observed the Army and Air Force both noted that aircraft capable of performing future CAS missions would have characteristics also required of air interdiction aircraft, including high subsonic speed and maneuverability, which would allow the aircraft to avoid air defense threats. The GAO reported that, although operations against enemy follow-on forces involving ground forces are a part of current Army doctrine, officials indicated that the Army may not be able to effectively implement the doctrine until the late 1990s. The GAO concluded that effective implementation of these operations will require the fielding of surveillance, targeting, and weapons systems, which are currently under development. Army and Air Force officials told the GAO that the Joint Surveillance Target Attack Radar System (JSTARS) was the primary system needed for a fully effective capability to attack follow-on forces. The GAO observed that the Air Force initially planned to field the JSTARS in FY 1993, but this date has slipped to about 1996, due to

Now on pp. 15-16.

technology development delays and budget constraints. (pp. 17-18/GAO Draft Report)

DOD RESPONSE: Partially concur. The Army did not comment on specific Air Force aircraft performance characteristics.

- **FINDING F**: **Air Force Concerns About A-10s**. The GAO reported that, even though Air Force officials spoke highly of the A-10 effectiveness in low- to mid-intensity conflicts, they assert its effectiveness in a high-intensity conflict (such as the one that would be encountered in central Europe) is questionable. According to the GAO, the Air Force is most concerned about the A-10 survivability, given the increasing number and lethality of Warsaw Pact air defense systems being fielded or planned for the mid-1990s. The GAO added that the projected threat includes a combination of anti-aircraft artillery with improved radar, improved infrared and radar controlled surface-to-air missiles, emerging laser and radio frequency energy weapons, and improved Soviet air-to-air fighters. The GAO noted that, in October 1987, the United States Air Forces Europe completed a threat analysis for the A-10 in the European central region, which supports the Air Force concerns about the A-10 ability to survive the increasing air defense capabilities of the Warsaw Pact forces. The GAO reported that the analysis addressed the current and future Soviet threat to the A-10 in this region, and "... suggests that the A-10 is rapidly becoming less survivable on today's battlefield." The GAO observed that the Air Force analysis addressed the following specific A-10 concerns:

  - slow speed and inability to maintain speed and acceleration in tight turns, which increases the A-10s vulnerability to lethal hits in this environment, because the slower the aircraft speed the longer the aircraft is exposed to the air defense weapons;
  - the limited night and adverse weather capability (although the Air Force planned to equip the A-10 with the Low Altitude Navigation and Targeting Infrared for Night System, which would have given it night and adverse weather capability, the Air Force decided against it because of the system's high cost); and
  - the ability to support the Army in its attack on follow-on forces with troops and for more timely BAI, since attacking aircraft are expected to encounter high-intensity air defense threats in route to, from, and in the target area. (pp. 19-20/GAO Draft Report)

Now on pp. 17-18.

DOD RESPONSE: Concur.

- **FINDING G**: **Prior Air Force Assessments of Aircraft Options**. The GAO reported that, in April 1985, the Air Force issued a

report entitled, "Close Air Support Investigation," which culminated a 6-month "quick-look" at designs for primarily new, fixed wing CAS aircraft for the mid- to late-1990s. The GAO observed that four aircraft manufacturers--Boeing Military Aircraft Company, Fairchild Republic Company, Northrop Corporation, and Rockwell International--submitted conceptual aircraft designs in response to the Air Force request for information. The GAO found that, after evaluating the designs, the Air Force reported (1) the A-10 would lose its effectiveness in the CAS role in the mid-1990s (due to the increased threat), unless the aircraft receives extensive improvements, (2) the CAS issue required further analysis before the optimum solution could be identified, and (3) modifications to aircraft, such as the F-16, should be considered to examine their feasibility and cost-effectiveness in the future CAS role. The GAO observed that the tactical aircraft development priority is the Advanced Tactical Fighter and the Air Force cannot afford to fund two development projects concurrently. According to the GAO, the Air Force is concerned that any additional developmental efforts would divert funds from the advanced fighter. The GAO noted that, historically, new aircraft development efforts take about 10 years to complete before any production aircraft become available, which is not compatible with the Air Force desire to have the A-10 follow-on aircraft available by 1993, and restricts the options to modifying existing or in-production aircraft. The GAO found that, beginning in the late 1980s, four contractors responded with proposals--General Dynamics with an F-16 derivative, LTV Corporation with a modified A-7, Northrop Corporation with the F-20, and McDonnell Aircraft Company with the AV-8B. The GAO reported that, in December 1986, the Air Force recommended two initiatives to the Office of the Secretary of Defense--(1) upgrade the Air National Guard A-7 aircraft and (2) replace the A-10 with the A-16. The GAO found that the OSD authorized the development and testing of two modified A-7s, but did not approve replacing the A-10s with A-16s because OSD officials were concerned the Air Force had not considered all the viable alternatives to the CAS and BAI issue, especially the possibility of developing a low cost CAS-only type aircraft. The GAO added that the Air Force Scientific Advisory Board (SAB), which concluded the CAS and BAI mission are sufficiently different for each to warrant a separate aircraft, also raised concerns about the follow-on aircraft. (pp. 2-5, pp. 20-22/GAO Draft Report)

Now on pp. 2-3, 19-20.

DOD RESPONSE: Partially concur. An A-10 upgrade also has been considered and currently is being considered in ongoing studies. In reference to the SAB concern over CAS weapons (defined as direct fire/minimal collateral damage), the paucity of CAS weapons combined with the large inventory of 30mm ammunition makes A-10 retention very attractive. In addition, two aircraft development projects could occur

concurrently if each had the appropriate priority to be funded in the Air Force budget.

- FINDING H: Close Air Support Aircraft Design Alternative Study. The GAO reported that, concerned because the Air Force may not have sufficiently considered all viable aircraft alternatives or adequately emphasized the CAS mission, the OSD directed the Air Force to perform the Close Air Support Aircraft Design Alternative (CASADA) study and also established controls over the study. The GAO found that the OSD review group was given the authority to control study funding and to review and approve the statement of work and the mission requirements document before release to the contractors.

  - Study Approach. The GAO learned that the Air Force designed a three-phase approach to the study, as follows:

    1. problem definition;

    2. aircraft design concept development; and

    3. aircraft alternatives assessment.

  - Study Schedule Delayed. The GAO found that the CASADA study original schedule called for awarding contracts by August 1, 1987, and for completing the study by March 30, 1988; however, delays in developing the mission requirements package (MRP) caused about a 5-month slip in the contract award dates and a corresponding slip in the completion date to September 1988.

  - Study Cost. The GAO reported that, according to the CASADA project manager, the study will cost about $8.5 million--about $4.85 million for aircraft manufacturers and $3.65 million for in-house study design, MRP development, and design assessments.

  - Study Results. The GAO noted that the Air Force expects to get about 20 aircraft designs from the study, one of which will be the General Dynamics modified F-16.

  The GAO explained that the Air Force plans to assess the reasonableness of the manufacturer designs and evaluations in comparison to MRP requirements, but does not plan to rank the designs; instead, the contractor designs and evaluations and the Air Force assessments will be provided to the review group for further evaluation. The GAO also learned that, two contractors will compare three to five of the manufacturer designs with current aircraft to determine which designs best meet mission requirements for survivability, effectiveness, and cost. (pp. 3-4, pp. 22-24/GAO Draft Report)

Now on pp. 2-4, 20-22.

DOD RESPONSE: Concur.

- **FINDING I: Mission Requirements**. The GAO found that, before the CASADA study, CAS requirements were not clearly defined. The GAO reported that the Air Force Aeronautical Systems Division, which analyzed the proposals from the 1985 solicitation, concluded all were technically viable candidates and it was difficult to eliminate a candidate because CAS requirements were not specific. The GAO further reported that, since that time, however, both the Army and the Air Force have more fully explained the tactical air support requirements. The GAO noted that the Air Force also provided the manufacturers with more specific aircraft design options to be considered in phase 2--specifically (1) aircraft hardware requirements, (2) aircraft performance parameters, and (3) reliability, maintainability, and supportability requirements. The GAO also found that some of the design requirements for new aircraft are more stringent than those for modified aircraft (for example, under the reliability and maintainability requirements, combat turnaround time for new aircraft is 15 minutes versus 25 minutes for modified aircraft). (pp. 24-25/GAO Draft Report)

Now on pp. 22-24.

DOD RESPONSE: Concur. Inclusion of BAI as a prime (rather than secondary) mission for the CASADA designs means the new CAS aircraft may be designed to the BAI requirement rather than to a CAS requirement. The F-16 can do the BAI mission; the question is can it survive in a CAS mission and is it a suitable aircraft to replace the A-10 or is a new aircraft designed for CAS a better choice?

- **FINDING J: Cost and Budgetary Implications**. The GAO noted that, according to the Air Force, the estimated cost of developing a CAS and BAI aircraft to replace the A-10 would require $2 to $3 billion. The GAO further noted that, although the DoD review group, in its comments on the MRP, recommended the unit cost for a new aircraft be between $7 to $13 million, the CASADA MRP set only a lower unit cost limit of $7 million, but not an upper limit. The GAO found that the contractors involved in the CASADA study are projecting a unit cost ranging from $8 to $30 million. The GAO also reported that the 1985 Air Force request for information, which considered modifying in-production aircraft, estimated a unit cost between $7 to $12 million, with the A-16 estimated to cost about $110 million for development and $13 million per aircraft (FY 1986 dollars). The GAO concluded that the total program cost of the A-10 replacement is unknown and cannot begin to be estimated until key decisions on aircraft and schedule are made. Although Air Force officials indicated they are uncertain when funding for a replacement aircraft will be requested (because the CASADA study is underway and decisions on the A-10 replacement have not been made), the GAO reported that

Now on pp. 4, 25.

in a March 21, 1988, hearing before the Senate Committee on Armed Services, the Chairman of the DoD review group stated that such funds will be requested in the FY 1990 budget and, further, that the request will be made, even if the final decision on the replacement aircraft has not been made. (p. 5, p. 26/GAO Draft Report)

DOD RESPONSE: Partially concur. There is no uniquely defined A-10 replacement program in the Air Force budget other than that which would be part of the F-16 procurement. This was an issue addressed by the Defense Resource Board (DRB) in the Fall of 1987 and the DRB will consider it again in the Fall of 1988, prior to finalizing the FY1990-FY1991 Budget Submission. During the hearing, the DoD did not state that funds would be requested in the FY 1990 budget. Rather, the DoD stated that we are hoping to be in a position by the fall to decide whether or not to leave a hole or a place in the five year plan for a new close air support aircraft.

- FINDING K: Schedule For Replacing A-10. The GAO reported that the Air Force wants to begin replacing the A-10s in the CAS role as early as 1993, some 2 to 5 years earlier than their 20-year service life, and which would be much earlier than required by their structural life. The GAO found that the current CASADA study establishes two time frames for replacing the A-10s; a 1992 to 1995 time frame for an upgraded, existing/in-production replacement aircraft and a 1995 to 2000 time frame for a new aircraft. The GAO observed that the Air Force has not clearly articulated reasons for wanting to replace the A-10 early and why the 1993 time frame is critical. The GAO noted, however, that at the same March 21, 1988, hearing before the Senate Committee on Armed Services, the Chairman of the OSD review group also stated he was not sure the mid-1990s date for replacing the A-10 is all that critical. The GAO observed that Air Force studies show (1) the enemy threat in the CAS and BAI arena is anticipated to increase significantly in the post 1994 time frame and (2) the A-10 and other aircraft survivability will suffer due to this increasing threat. The GAO concluded, however, that since the Army will not be capable of conducting operations against follow-on forces with troops until the late 1990s (except on a limited scale), the A-10 early replacement does not appear to be predicated on the Army CAS needs beyond the front lines. (p. 2, p. 45, pp. 26-27/GAO Draft Report)

Now on pp. 2-3, 26.

DOD RESPONSE: Concur. Maintaining the A-10 in the force structure or upgrading it remain as options. There is funding in the Air Force budget for modification of communications, navigation, terrain avoidance and targeting capability. Reengining and/or the addition of a Forward Looking Infrared (FLIR) is still an option.

Now on pp. 3-4, 26-27.

- **FINDING L: Force Structure Implications.** The GAO observed that decisions on the A-10 replacement will change the Air Force tactical force structure since a replacement aircraft (which could take about 9 to 11 years to develop) could require maintaining existing A-10s in the force until the late 1990s. The GAO noted that this, in turn, could delay the planned conversion of the 120 A-10s to a forward air control role by the late 1990s. The GAO reported that, according to Tactical Air Command officials, in April 1989, the Air Force plans to replace one Air National Guard unit A-10s with F-16s and designate that unit's aircraft to perform the CAS and BAI missions. The GAO further reported that the Air Force could also replace the remaining A-10s with F-16s, but if so, about 50 percent of the tactical forces would then be F-16 type aircraft. The GAO concluded that, if the DoD approves the A-16 as the A-10 replacement, the Air Force could see an earlier change in the tactical force structure than would be realized from developing a replacement aircraft. (p. 3, pp. 5-6, p. 27/GAO Draft Report)

  DOD REPONSE: Concur.

RECOMMENDATIONS

- **NONE**

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